

REMARKS

The present amendment and remarks are submitted in response to the Final Rejection dated December 6, 2007. Applicants respectfully request that the amendments and remarks be entered as a matter of record.

Before addressing the specific grounds of rejection, Applicants take this opportunity to discuss the present invention. Applicants have discovered that a Re containing gate deposited atop a Hf-based gate dielectric from a $\text{Re}_2(\text{CO})_{10}$ CVD precursor produces a gate having an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$. Applicants observe that an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ is not necessarily present with gate structures containing Re. For instance, Applicants observe that prior attempts to integrate Re films into gate structure, which do not incorporate a $\text{Re}_2(\text{CO})_{10}$ precursor, resulted in halogen incorporation and high carbon concentrations, both phenomena resulting in a decreased interface charge density. Therefore, Applicants submit that because the prior art fails to disclose forming a Re-containing gate from $\text{Re}_2(\text{CO})_{10}$ CVD precursors, the applied prior art fails to teach or suggest an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$, as recited in Claims 1, 10 and 17. Turning to the present grounds of rejection.

Claim 1 is objected to for minor informalities.

Claims 1, 2, 4, 7-11 and 14-17 stand rejected under 35 U.S.C. § 103 as allegedly unpatentable over U.S. Patent Application Publication No. 2004/00800001 to Takeuchi ("Takeuchi") in view of U.S. Patent Application Publication No. 2002/0155689 to Ahn et al. ("Ahn et al.") and U.S. Patent No. 6,248,673 to Huang ("Huang '673"). Applicants respectfully disagree and submit the following.

Applicants have amended claim 1 to overcome the present objection.

Turning to the rejection under §103, Applicants submit that the applied prior art fails to render Applicants' invention unpatentable because the applied prior art fails to teach or suggest each and every limitation of Applicants' amended Claims 1, 10 and 17. "To establish a prima facie case of obviousness of a claimed invention all the claimed limitations must be taught or suggested by the prior art". *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 44, 496 (CCPA 1970). Amended Claim 1 recites:

A metal oxide semiconductor (MOS) device comprising:
a semi-conducting substrate having source and drain regions;
a gate dielectric of less than 100 Å thickness on said semi-conducting substrate, said gate dielectric is selected from the group consisting of HfO₂, ZrO₃, Y₂O₃, silicates or nitrogen additions of HfO₂, ZrO₃, or Y₂O₃, and mixtures thereof; and
a Re-containing gate located directly on a surface of said gate dielectric, said Re-containing gate has an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ and a work function that ranges from about 4.6 eV to about 5.0 eV, and wherein said Re-containing gate is derived from a Re₂(CO)₁₀ CVD precursor.

Applicants observe that the Examiner fails to indicate where Takuechi and Ahn et al. disclose a gate structure having an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$. Applicants submit that this claimed feature is not disclosed in any of the applied prior art.

Referring to Page 4 of the present Office Action, the Examiner alleges that "after performing the hydrogen anneal taught by Huang, it is inherent that the trapped charge density will be about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ ". Applicants respectfully disagree and submit the following.

The Federal Circuit has held that inherency cannot be based on mere speculation. See e.g., *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1269, 20 USPQ2d 1746,

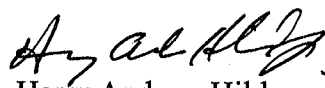
1749 (Fed. Cir. 1991) (inherency “may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.”); *Crown Operations International, LTD v. Solutia Inc.*, 289 F.3d 1367, 1377, 62 USPQ2d 1917 (Fed. Cir. 2002) (alleged limitation must be necessarily present so that one of ordinary skill would recognize its presence); *Trintec Indus., Inc. v. Tup-U.S.A. Corp.*, 295 F.3d 1292, 1295, 63 USPQ2d 1597, 1599 (Fed. Cir. 2002) (“Inherent anticipation requires that the missing descriptive material is ‘necessarily present,’ not merely probably or possibly present, in the prior art.”) (quoting *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1959-51 (Fed. Cir. 1999)); *Elan Pharmaceuticals, Inc., v. Mayo Foundation for Medical Education and Research*, 304 F.3d 1221, 1228, 64 USPQ2d 1292 (Fed. Cir. 2002) (“When anticipation is based on inherency of limitations not expressly disclosed in the assertedly anticipating reference, it must be shown that the undisclosed information was known to be present in the subject matter of the reference.”)

In light of the standard established by the Federal Circuit, the Examiner has failed to establish the inherency of an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ in a gate structure having a Re containing gate electrode. Specifically, as discussed above, Applicants provide the claimed trapped charge density by depositing a Re containing gate atop a Hf-based gate dielectric using a $\text{Re}_2(\text{CO})_{10}$ CVD precursor. Applicants observe that none of the applied prior art, i.e., Takeuchi, Ahn et al. and Huang, disclose forming a Re containing gate using a $\text{Re}_2(\text{CO})_{10}$ CVD precursor. Therefore, since the applied prior art fails to disclose Applicants’ CVD precursor, the applied prior art fails to teach or suggest a gate structure having an interface trapped charge density of about $3 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$ to about $4 \times 10^{10} \text{ cm}^{-2} \text{ eV}^{-1}$, as recited in Claims 1, 10 and 17.

The rejection under 35 U.S.C. § 103 has been obviated; therefore reconsideration and withdrawal thereof are respectfully requested.

Thus, in view of the foregoing amendments and remarks, it is firmly believed that the present case is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,


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